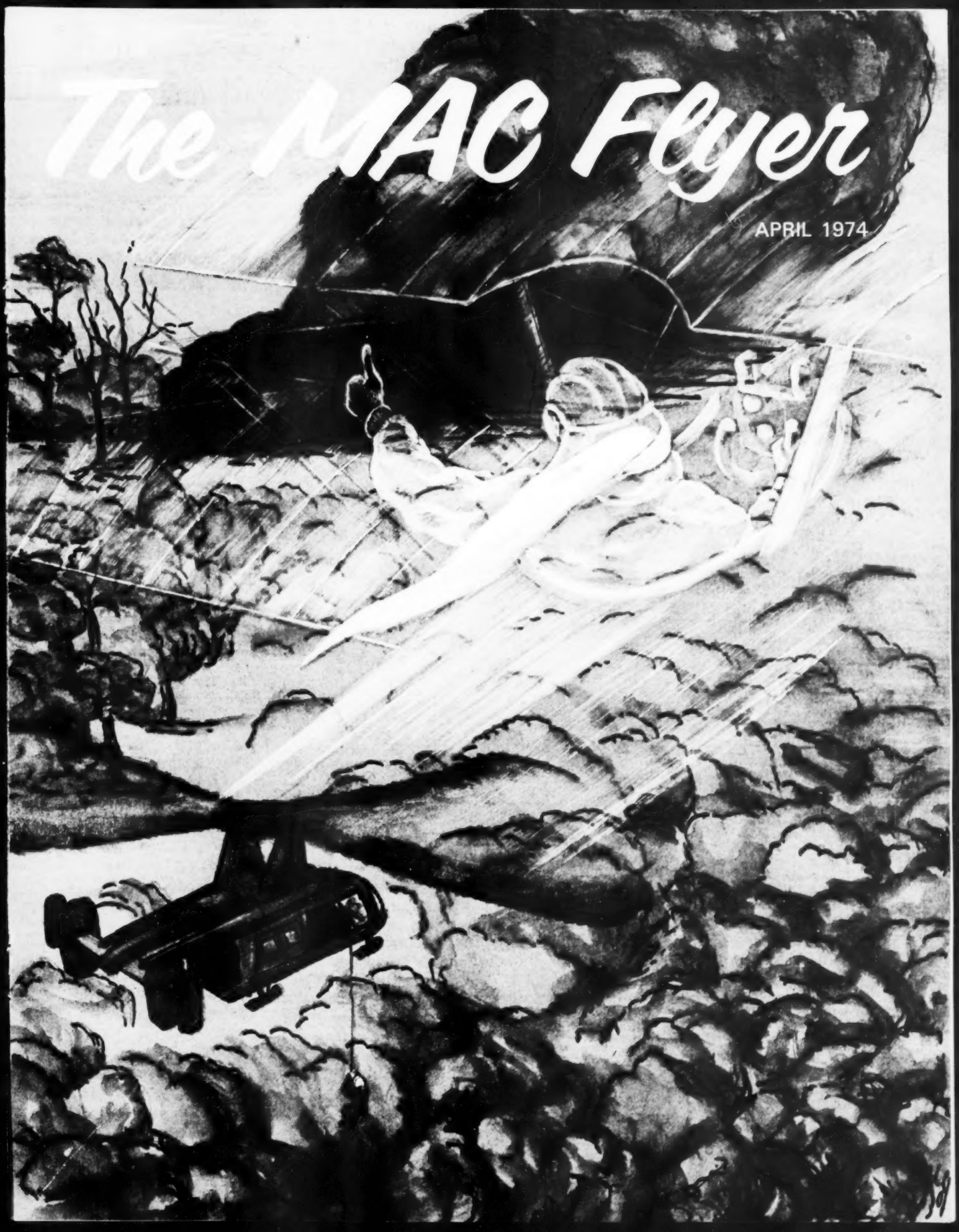
The MAC Flyer
APRIL 1974

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The MAC Flyer

For Greater Efficiency
in MAC Air Operations

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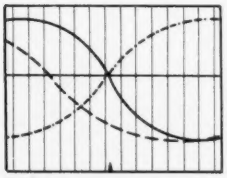
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COVER: THE HERITAGE — an original painting and poem by Lt Col Clyde W. Lemke, USAF, retired, formerly of MAC/DOV.

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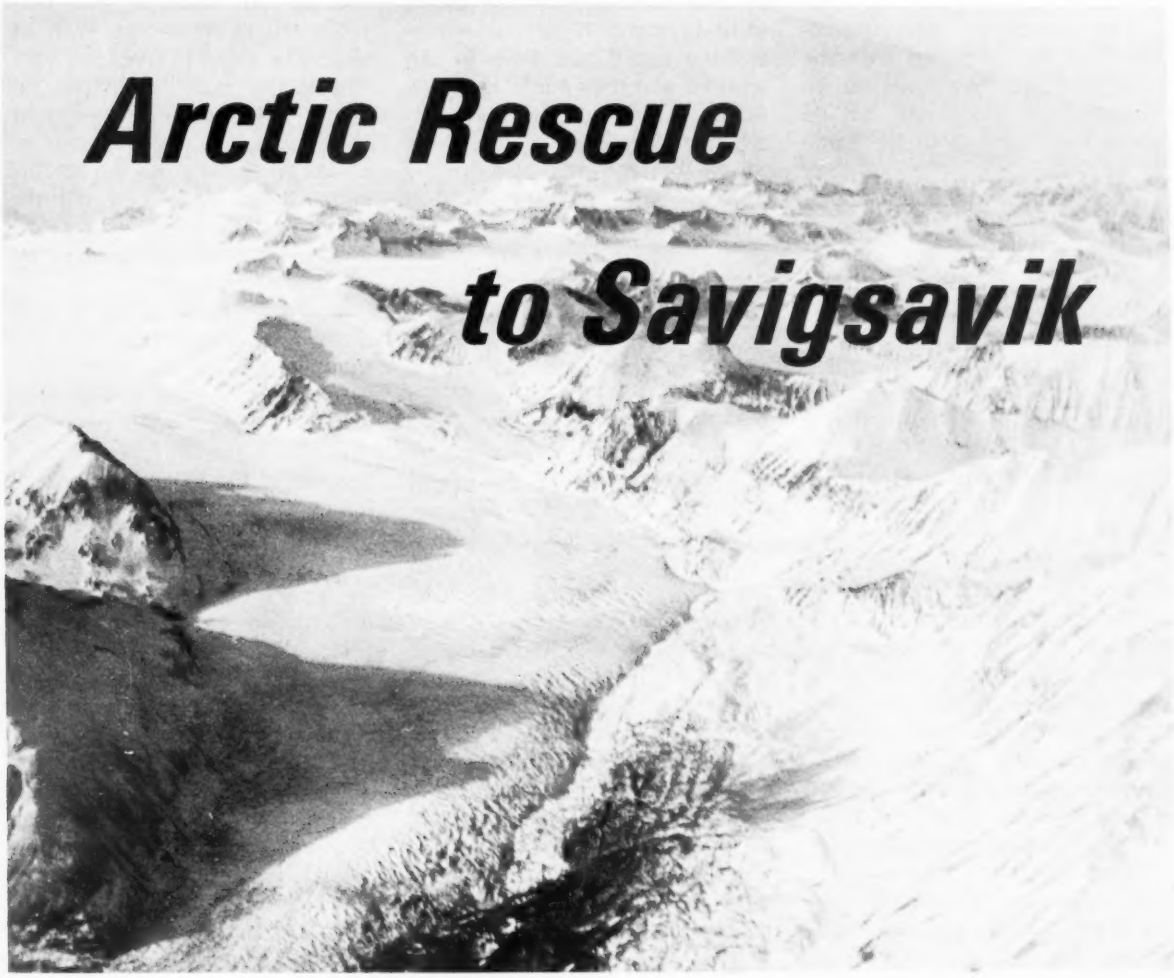
An injured child, grim weather, and a pilot short-cut are ingredients of a nightmare on an . . .

Arctic Rescue to Savigsavik



by Maj George D. Burgess, Associate Editor

"Joe, Joe!" The voice awakened the aircraft commander.

"Huh, what?"

"It's me, Van. We have a scramble. The Danish Liaison Officer called about a flight to Savigsavik. A little girl down there was bitten by a dog. She's in pretty bad shape and they want us to get her to Thule Hospital as soon as possible."

Joe was out of bed and beginning to dress. His copilot filled him in on the details. "I'll meet you in the truck in five minutes." Joe could hear the wind howling outside his window as he spoke. Pulling his parka hood over his head, he stepped outside to the alert truck.

All detachment personnel were in the hangar by the time the pilots arrived. Maintenance men were towing the helicopter out.

Joe turned to his copilot. "I'll file the clearance while you check the radios." The pilot began filling in the missing numbers on the form as he dialed the weather station.

"Your Thule weather is three thousand feet overcast, visibility three miles in blowing snow, wind one five zero degrees at eighteen, gusting to two five knots. Temperature, minus twenty-three de-

grees. The ceiling should lower to two thousand feet soon, but the visibility will remain about the same."

The forecaster was unemotional as he continued with the grim forecast. "We have no information on Savigsavik, but I'd guess they have about the same as we do."

That forecast meant a tough flight ahead. But with 24 hours of darkness a day, Joe thought there was no reason to wait for anything better. The weather would probably stay the same for days. The village was sixty miles away and if they encountered weather problems en route, they'd have to turn back to Thule.

Joe climbed into the helicopter. "Before starting engines checklist." The crew droned methodically through the checklists and received taxi clearance.

The helicopter rolled slowly through the powdery snow. A swirling haze danced in formation with the rotor blades. The pilot lowered the collective periodically to prevent a "whiteout"as the snow billowed upward. Tower cleared the helicopter for takeoff.

"Van, watch the torque pretty close. I'll have my hands full trying to see through the snow until we get through translational lift." The pilot knew it would be a hairy takeoff.

The copilot complied as the big helicopter moved forward. Gusts tossed the aircraft around as it lifted off. "We'll get a lot of turbulence off the icecap until we get to altitude." Joe wished he didn't have to make the flight in the dark. "We'll want to get a wind check as soon as possible. I'll fly a tacan radial for as long as we can hold lock, and we'll see what heading we have to fly to stay on course. You time the DME and get a ground speed check." Joe knew the tacan would only be good for about 25 miles at their altitude, but he didn't want to climb higher. A higher altitude would put them in the weather and they might have difficulty getting down to VMC conditions to locate the village. Some of the older heads liked to fly low in case the transmission failed and they needed to get on the ground in a hurry.

"Have approach control check our position. Between the approach radar and the tacan, we should at least start out with a pretty accurate heading. Watch the whisky compass close though." Both pilots were acutely aware that with 76 degrees of variation, the slaved compass couldn't be trusted completely.

The copilot made the call and marked the position on his chart. They leveled-off at the base of the clouds just as the lights of the base disappeared behind them.

"It's like flying in an ink bottle," complained the aircraft commander as he beamed his flashlight outside, checking for structural icing. "Too cold for icing. It's minus twenty-nine degrees. Wow! The chill factor must be around minus eighty."

Long johns, heavy socks, mukluks, winter flying suit, iron pants, parka, heavy gloves, and survival gear made flying duties more difficult. But the barest possibility of an emergency landing on the ice dispelled any feeling of discomfort caused by heavy clothing.

The tacan broke lock at 23 miles. Approach control radioed that the helicopter was out of radar range. Joe shrugged. "Well, it's straight DR now. Let's monitor the heading real close — we don't want to fly the wrong heading and miss the village."

The turbulence, instead of diminishing, continued to toss the aircraft around and both pilots fought off vertigo. "Van, we should be about to cross the fjord. Check the radar altimeter. I'm pretty busy keeping us upright. It should indicate a rapid increase when we cross the leading edge of the fjord and it'll decrease rapidly on the other side. That's not much to navigate by, but it's a backup."

How nice it would be to have a navigator aboard right now, Joe thought, but this helicopter didn't have much for a nav to work with anyway. Might as well press on. "Let's hope the DR takes us close enough to the village to see the lights. O, for a radio beacon to home in on."

"What's the fuel situation?" he asked, wanting to calculate how long they'd have to locate the town in case it didn't appear at their ETA. The pilots determined they'd have approximately 30 minutes to fly search patterns before they'd be forced to return to Thule for fuel.

The radar altimeter told them they had crossed the fjord and should be overhead Savigsavik in about 15 minutes. They didn't dare descend until absolutely sure they had the village in sight — it was on an island snuggled next to a tall peak.

The ETE finally elapsed — but, no village. "Let's fly for another 10 minutes and then turn back and try to locate the lights." Joe wanted to be sure they didn't turn around before reaching their destination. But after another 10 minutes it became painfully clear they had missed the village. "I'll make a turn to the south and we'll parallel the outbound course. Maybe we'll spot something."

He made a slow turn. Turbulence continued pounding away at the helicopter. The rotor blades shuddered, indicating an approaching stall, so they slowed down to 80 knots.

"I see a light!" shouted the copilot. "Over there at two o'clock." Now, the pilot spotted the faint flicker. He turned toward it.

"Once we make a positive ID on the village, I'll start down. We'll have to drop smoke to get a wind check."

Harry, the mechanic, had already prepared a flare for the drop.

The village slowly approached under the nose of the big aircraft as Joe descended to drop altitude. "Five seconds out, cleared to open the door." He cleared the mechanic to drop the pyrotechnic and then circled to observe the wind direction. He shined the spotlight on the drifting smoke.

They found, to their dismay, that the only safe approach would be over the village fishing boat, whose mast extended upward to a height of forty feet.

The helicopter turned final. The pad was marked with light reflectors, but the crew knew it would be obscured at touchdown by the blowing snow.

The first two approaches were terminated when the pilots lost all outside visual references just prior to touchdown. On the third try, the blowing snow dissipated somewhat and the pilot managed to land.

"I was about to call it quits after those first two tries," sighed a relieved aircraft commander. "Let's get the patient on board and get out of here."

The villagers were waiting and the injured girl was soon strapped in for the takeoff. The liftoff and climbout were uneventful.

The return flight was much like the one outbound, except the crew wasn't looking for faint lights in the night. A number of radio aids awaited the returning helicopter to guide it to the runway.

Joe briefed his crew. "I'll fly an ILS approach to the runway and when we're in the clear we'll fly over to the ramp in front of the hangar and land. That way, we can expedite. We'll have plenty of lighting over at the hangar to make a safe landing."

ARTIC RESCUE — continued

The copilot looked at the AC, not certain what he had heard. Helicopter pilots had always landed on the runway at Thule during the dark months because of the likelihood of a "whiteout" condition which always existed on the ramp. It was bad enough to land on the runway.

"You sure you want to land on the ramp? It was pretty snowy when we left. We can land on the runway and taxi in pretty quick."

"No problem." The aircraft commander had reviewed the situation but elected to land on the ramp to save time. "We can cut down the taxi time by ziggying over to the ramp."

Approach control cleared the helicopter for the instrument approach. The aircraft descended down to a point where the pilots could see the runway approach lights. "I'm breaking it off," announced the pilot, and steered toward the hangar.

"Recheck the gear."

The helicopter approached the ramp. At an altitude of fifty feet, the rate of descent was slowed to 100 f.p.m. By the time the aircraft had reached a height of 15 feet, its forward speed was almost zero. As the main landing gear touched down, the landing lights and spotlights shot reflections into the cockpit off the blowing snow, distorting the pilot's outside references. As he started to pull up the collective, the pilot knew he should have landed on the runway.

The helicopter slammed down hard. Joe always flew with minimum collective friction applied and as the aircraft contacted the concrete, his collective inputs set off a series of uncontrollable bounces. After a half dozen gyrations, the helicopter tipped to the right. The right landing gear collapsed under the pressure and the main rotor blades whapped aimlessly at the ramp.

The pilot knew exactly what to do now. He chopped power and shut the engines down. The helicopter rested in an awkward position. Fortunately, the fuel tanks hadn't ruptured so there was no fire. The crew and patient evacuated the aircraft.

By this time the blowing snow had settled. The helicopter lay cocked, twisted, and broken. It would be a long time before this bird would lift off again.

The television set brought Joe back to reality. He glanced up at the picture. The "Thule Big Eye" Show was on — that meant he had dozed for a couple of hours. A bad dream. That's what it had been. He hadn't really crunched a plane on the ramp.

He thought for a while but couldn't figure out why he, of all people, would have such a nightmare. Perhaps it was because he constantly hammered at his pilots to avoid the same actions he had just dreamed about. He was glad he used precautions at Thule.

* * *

Joe fits perfectly the description of the experienced MAC aircraft commander — not the guy in the dream, but the Joe that couldn't even imagine dreaming of such an airborne shortcut because he knows the rules and insists on following them.

But even experienced pilots are subject to temptations. Perhaps that's what Joe's dream was all about — one of the many temptations that slipped out of his subconsciousness as a reminder before it could do any harm.

"Airplanes Collide Over.....!"

Black boxes probing the sky may one day end the threat of mid-air collisions.

Midair! This paralyzing word is enough to shock the nervous system of the most hearty aviator as it comes crackling over an aircraft radio. It is probably the most dreaded word a crew member can hear while airborne.

The National Transportation Safety Board documented 105 midair collisions involving commercial, military, and general aviation aircraft during the bumper years between 1964 and 1968.

Since that time the midair threat has provoked research into electronic methods to make flying in high density areas safer than it is today. Both the FAA and the U. S. Air Force are searching for hardware which will do the trick.

Today, the FAA is evaluating various prototype collision avoidance systems. Their objective — to write a national standard for such a system. Prototype systems are now being tested on FAA, general aviation, and airline flights throughout the United States.

There are two basic categories of systems on which extensive tests are being run: the Collision Avoidance System and Pilot Warning Indicators.

The Collision Avoidance System (CAS) is one which detects all aircraft representing a potential danger, evaluates the hazards presented, and determines whether an avoidance maneuver is required.

The Pilot Warning Indicators system (PWI) is generally accepted as a less sophisticated collision prevention system which is economically within reach of the general aviation user.

The basic difference between the two systems is that while the Collision Avoidance System warns of danger and determines avoidance maneuvers which should be taken, the Pilot Warning Indica-

tors system simply warns of possible danger. With this latter system, the pilot must decide what type of evasive maneuver should be taken.

Several concepts embodying these two principles are being tested. The three which will be discussed briefly are: The time-frequency concept, the proximity concept and the discriminate collision avoidance concept. Each of these is compatible with existing Air Traffic Control functions.

Time-Frequency Concept

This is a Collision Avoidance System concept based on computing air-to-air distances and closure rates between aircraft. It requires similar equipment in each aircraft and utilizes extremely precise time synchronization. For example, when aircraft A transmits a signal to aircraft B, a range timer on aircraft B begins when it receives the initial signal and stops upon signal termination. This measurement of elapsed time provides precise range measurement between the two aircraft.

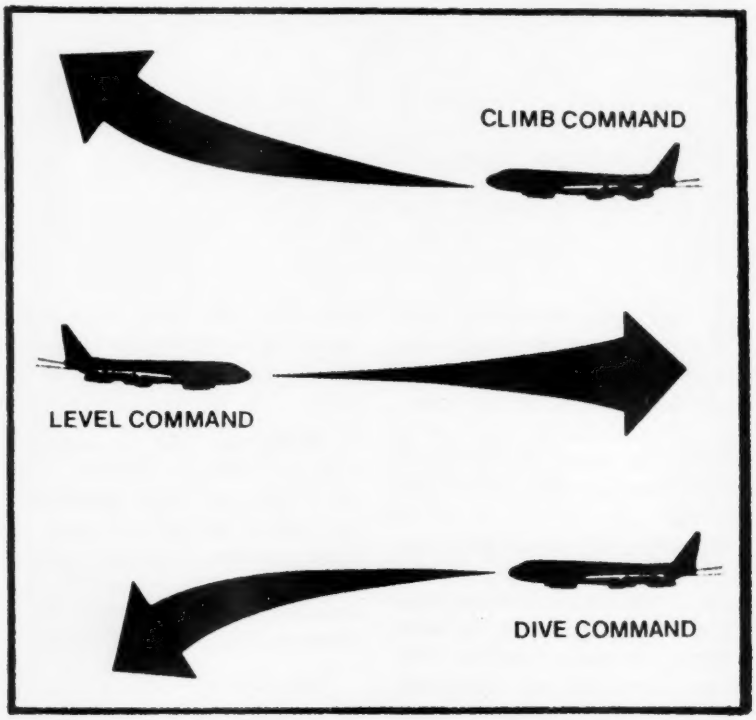
Closure rates are automatically computed by measurement of the angular displacement and time and distance variations between aircraft. The frequency of the received signal and range variations between succeeding transmissions measure these variations. This function is particularly effective in determining range and closure rate for fast moving aircraft. Ranges and closure rates to the nearest possible collision point are automatically calculated and activate cockpit warning devices if a collision threat is indicated.

This equipment provides at least a 60 second warning even for supersonic speeds (or 1½ miles for slower speeds) at air-to-air ranges of 40 to 50 miles. Some types of equipment employ a single frequency, while some other models use multiple frequencies, and depend upon synchronized transmissions from a ground station. The ground station provides effective time synchronization coverage at line-of-sight ranges up to 120 miles. Electronic components in the system permit collision avoidance integrity for 10 to 15 minutes after the aircraft is out of transmission range of the ground station for the participants.

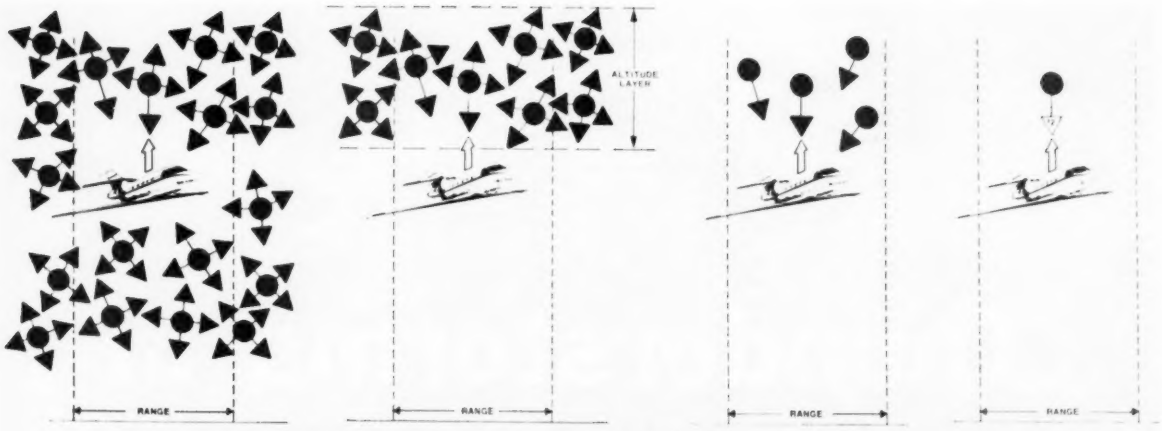
Proximity Device

In one high density area of the country, a company was selected to develop and build a suitable aircraft proximity warning device with emphasis placed on reliability, simplicity, and small size. Delivery of the first device began in 1969 and, to date, over a half million flight hours have been accumulated on these units.

This Pilot Warning Indicator alerts the pilot with audio and visual alarms whenever another aircraft equipped with a similar



A Collision Avoidance System directing evasive maneuvers.



A Discriminite System separating the wheat from the chaff.

device penetrates its electronic protective shield. The device tells the pilot the relative altitude and bearing of the intruder. The pilot then locates the intruder visually and determines whether corrective action is needed. If visual contact is not possible, an evasive maneuver based on transmitted altitude and bearing data (displayed in the cockpit) may be initiated.

Evolving from this simplified proximity warning device was a Collision Avoidance System (now in experimental use) which provides a 25 to 40 second "time to collision" warning within designated warning bands. Altitude bands in one model of this device warns the pilot when another aircraft is within plus or minus 1,300 feet; another model warns at plus or minus 3,200 feet.

Discriminate Method

This Collision Avoidance System concept consists of cooperative transponder environments where aircraft emit signals of up to 1,000 pulses per second. Each aircraft emits unique interrogations and is capable of discriminating the many thousands of replies that may fill the air at any instant.

Another discriminator in the system concept reduces the number of targets selected for simultaneous interrogation. This is called altitude probe coding. To accomplish this function, 500 feet thick altitude layers (the thickness is increased to 1,000 feet at altitudes above 10,000 feet) are assigned distinct codes. An aircraft replies only to probes within its altitude layers above and below its own flight path. Distant discrimination is performed automatically by a power budget unit in the transmitter and an analog circuit in the receiver. Together, these components eliminate irrelevant signals from distant aircraft.

A correlator in this system separates the replies intended for the aircraft from those not intended for it. When an actual "intruder" is detected by the correlator, the "intruder" is pinpointed to within 500 feet. A tracker is then assigned to that particular range, locking on the target. The system then computes the target range and closure rate. With this information, data processing in the system determines whether the target is a threat. If a threat is determined, cockpit warnings and recommended escape maneuvers are displayed.

These are a few of the devices being tested today, some of which give their designers reason to believe that a practical anti-collision system adaptable to today's aircraft is not far away.

While the search for such adaptable, reasonably priced system is underway in the United States, there are differences of opinion on whether anti-collision systems are adaptable to international use.

The ICAO 7th Air Navigation Conference position was that the primary system for preventing midair collisions, now and in the foreseeable future, continues to be an adequate air traffic services system, particularly Air Traffic Control (ATC).

Meanwhile, the most effective method MAC pilots have of preventing midair collisions remains strict compliance with ATC clearances, constant awareness of hazards in the immediate flying environment, and sharp eyes viewing outside the cockpit.

— adapted from ICAO BULLETIN

Retreating winter forces pursued by spring pause to do battle.
Thunderstorms in the Area!

What crew member who has brushed elbows with a thunderstorm hasn't had some apprehensive moments? Pilots and navigators routinely thread their aircraft through build-ups — using radar and eyeball — or circumnavigate the really bad ones. But no matter how often this occurs, the crew always feels relieved when the bumpy ride smooths out on the far side of a storm. And for a very good reason — the pounding an aircraft takes from a thunderstorm is a vivid reminder that we must respect them or become their victims.

Spring and its vernal attendant, the thunderstorm menace, is approaching in the CONUS. Transport pilots whose flights take them to the tropics may face them to some extent throughout the year. But before we start butting heads with these storms on a regular basis this year, we would do well to review the problems associated with thunderstorms and measures we can take to minimize the threat.

Off To Travis

Hand a copy of your ACM orders to our aircraft commander and come along on a typical spring flight from Scott AFB to Travis AFB. This journey is guaranteed to challenge all who respect thunderstorms.

* * *

The forecaster predicts the aircraft will climb out through a warm front with thunderstorms embedded in stratus clouds. Our flight will enter the front from the cold air side and exit the warm side, so we can anticipate turbulence in a matter of seconds after penetration. The radar's in pretty good shape, so there should be no sweat picking the way through the clouds. But without radar — no way. Anyway, regulations don't allow MAC aircraft without operational radar to penetrate thunderstorm areas.

Our aircraft is swallowed up by the stratus shortly after takeoff. The pilot and navigator work together to steer clear of the nastiest cells, some of which top out at 40,000 feet. They select which weak cells to penetrate, since there's no way to miss them all. It gets bumpy but the aircraft finally breaks into the clear between layers at 18,000 feet. Shortly afterward, we enter cirrus at 25,000 feet. The crew is especially cautious now and uses radar to keep out of the scattered cumulo-nimbus.

The Squall Line

Level at FL 350, the cruise checklist is completed. But there's no time to relax. The aircraft is in the clear again, but the forecast squall line lies ahead. It's a beauty — 300 miles long, 35 miles wide, and about 100 miles ahead of the cold front. The pilot knows this is where he'll encounter the most violent thunderstorms. He wants no part of it, so he requests clearance around. He's convinced he made the right decision because the tops are near 55,000 feet. Inside this mass lies a granite-like wall with updrafts and downdrafts violent enough to rip the aircraft apart.

Avoiding the squall line, the aircraft turns back toward course with the cold front activity directly ahead. The cumulus towers to 35,000 feet but widely separated cells permit easy penetration. The pilot is relieved to know that cold front weather is usually less se-

CB in the formation stage.

vere behind a violent squall line — but he never accepts that rule as gospel. However, it checks out this time and the aircraft zigzags in a westerly direction between clouds.

An hour later we approach the scenic Rocky Mountains. But there's not much time for sightseeing. Buckley Metro confirms the forecast — thunderstorms over the windward side of the mountains, topping out at 30,000 to 35,000 feet. Fortunately, they're pretty well separated and the big jet makes its way through.

After crossing these peaks, we glide along in the clear for a while. Below, cumulus clouds boil upward to 20,000 feet as the heated slopes send convective currents aloft. These will probably top out at 30,000 later in the afternoon.

The cumulus activity is left behind as the aircraft approaches the Sierra Nevada Mountains. Lenticular formations become visible on the leeward side. Tucked neatly beneath them are roll clouds, a clear indication of danger awaiting whoever approaches. We're okay, but pity the low-flying prop jobs that venture near.

By the time the flight approaches Travis, the sun is setting below the horizon and paints reflections from a small CB far out over the water. It reminds the pilot of the real granddaddies he has seen near the equator. Those ocean cumulus sometimes top out over 50,000 feet and often greet airborne intruders within 20 miles with lightning, hail, rain and turbulence.

But this small build-up in view is far away and the aircraft touches down on a dry Travis runway.

Another MAC mission completed in the usual professional manner without incident — but the mission was uneventful only because the pilot respected and avoided enroute weather.

Thunderstorm Hazards

Hazardous elements in thunderstorms are many. Such hazards as hail, lightning, tornadoes, and rain can turn a routine mission into a nightmare, or worse,

A fully matured CB spells bad news.

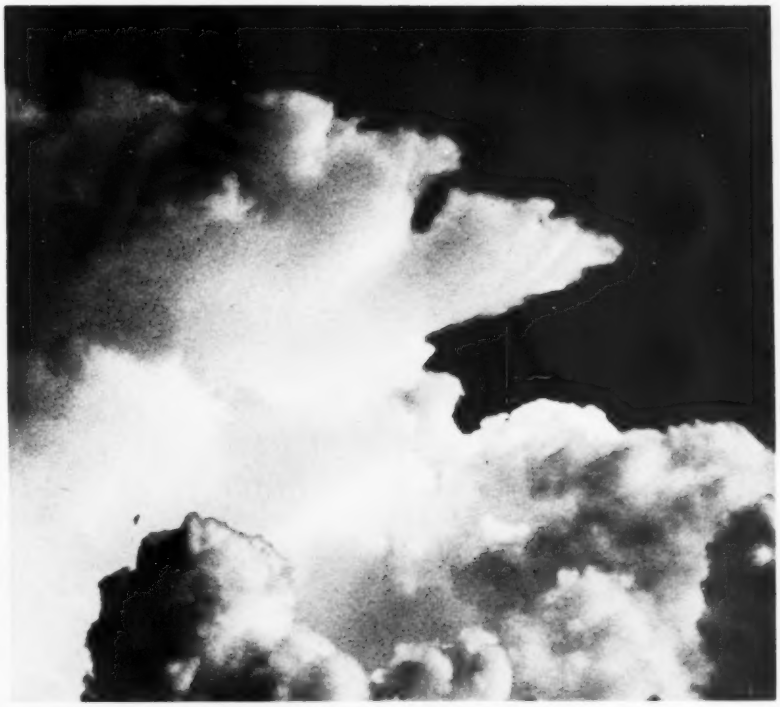
for the nonbeliever.

Hail is not found in every cumulus, but since it's so difficult to forecast, plan on its presence in all thunderstorms. Hail is most often found in a rapidly developing CB, but it is not restricted to clouds. Hail has been encountered 20 miles downwind as well as underneath thunderstorms — in clear air. In fact, 20 to 40 percent of all hail encounters occur in the clear air around the storm. The greater the height of a storm and intensity of the radar echo, the more likely the prospect of encountering damaging hail. Over the western Great Plains hail seems to accompany most thunderstorms.

Rain usually occurs beneath the freezing level. Precipitation and turbulence seem to go hand-in-hand, so if you identify rain, expect a rough ride if weather penetration is necessary.

Lightning is another potentially damaging element — another reason to give wide berth to thunderstorms. Electrostatic discharges are frequently encountered near the freezing level of a dissipating or decaying storm. A flight penetrating such weather activity near the freezing level is inviting lightning strikes and aircraft damage.

Tornadoes are usually thought of as threatening objects on the surface but they can also snatch an aircraft right out of the sky. Look out for them when you're near thunderstorms.



The anvil's greeting: hail.

How to Cope

From the first day you began flying you were probably warned to respect thunderstorms. The seasoned pilot knows he should not lock horns with CB's, but there will be times when you may have to penetrate a line of cells. And there may be radar failure after you've committed yourself to the penetration.

Your Dash One has guidance for thunderstorm and turbulence encounters. It recognizes that you need not rip up the aircraft just because you happen to get into a cell. Fly attitude. Set a power setting and keep it. Use your autopilot as the Dash One recommends. Don't horse the aircraft around or you'll probably pop some rivets — or worse. Remember, icing may be present in the thunderstorm, so if your aircraft is equipped with anti-icing equipment, fire it up well ahead of the encounter. Use your radar, but remember that even radar is not foolproof. A radar set needs an experienced crew to properly interpret its imagery. And even the most experienced crews can get only so far with a malfunctioning set.

Flights into thunderstorm regions should begin in the flight planning room. If you can flight plan around these areas, you're way ahead of the game. No rational crew would ever intentionally fly into thunderstorms. MACSUP to AFM 60-16 directs that thunderstorms be avoided by these distances: above FL 230 — 20 nm; below FL 230 with zero degrees centigrade or less — 10 nm; below FL 230 and above zero degrees centigrade — 5 nm.

Remember, if you find yourself getting too close for comfort, you still have the option of making a 180 before entering the clouds. Even if there's only one CB in the sky ahead of you, plan early to give wide berth. By doing so the odds of your bringing the aircraft and crew safely home to mama will be a helluva lot greater.

Do helicopter pilots possess an unusual instinct for detecting trouble before it strikes?

THE SIXTH SENSE

There may be those who will dispute the hypothesis, but it has been said that seasoned helicopter pilots possess keener flying instincts than other fliers.

There may be a case for disagreement. But record books bulge with accounts of daring missions, performed under seemingly nonsurvivable circumstances, in which the chopper pilot and his crew returned unscathed.

Low level missions with minimum navigation equipment, pickups in pitch black jungles, shattering ground-fire — these are a few of the obstacles surmounted by helicopter pilots in Southeast Asia alone.

There are many more cases — unchronicled for obvious reasons — in which reckless pilots on routine training missions pushed themselves and their fragile machines to the limit — and somehow lived to brag about it.

Instinct? Just plain luck? Or is there more to it than either of these obscure terms imply.

A noted reporter once observed that helicopter pilots seem different from their fixed wing counterparts. He characterized them as introverts — whereas other pilots are extroverts — brooding, while their fixed wing buddies brandish smiles of confidence. The reason, he surmised,

is that chopper pilots are conditioned by their environment to assume that if something critical hasn't already happened during their flight, it soon will.

This reporter was implying, possibly without realizing it, that helcopter pilots have a kind of "sixth sense" which often alerts them to impending danger. Identifying this sixth sense as the sign of an introvert might be a little rash, however, since many helicopter pilots are rather famous for their extroverted antics.

An old wives' tale? Like the hunter who claims the ability to think like his prey, or the fisherman who "reads" the water to find the big ones, few veteran helicopter pilots are likely to malign the existence of such a phenomenon.

Participants who survive any type of potentially hazardous endeavor seem to develop such instincts — the high wire performer, the professional automobile racer, the bullfighter. The amount of danger involved very often helps determine the degree of such an instinct. Certainly all pilots — not just helicopter pilots — are imbued with the sixth sense potential.

But it may be more visible in helicopter pilots simply because their flying environment requires constant vigilance and split-second decisions at low levels. In this respect, helicopter flying probably relates closer to the old "seat of the pants" flying than anything the Air Force offers. And this presents challenges and temptations — low altitude, low airspeed, and a machine which its pilot may feel a part of — similar to those facing pilots of the open cockpit era.

While it is not difficult to imagine that a "sixth sense" does exist, the prospect of explaining how it is attained is another matter. What are the ingredients of this unusual quality? Do helicopter students who have passed their first check ride suddenly find themselves ordained with such powers?

No one has yet ventured to define all of its ingredients. However, there is little doubt that experience plays a great part in it. Natural powers of observation, deductive powers, common sense, and judgment are all involved in this phenomenon. And certainly a most essential ingredient is knowledge — of the aircraft's limitations and the operating procedures required to fly it effectively. Without this knowledge, there would be no predetermined point at which a sixth sense could be triggered.

How many times have helicopter pilots broken off a routine maneuver simply because "it didn't feel right," and subsequently discovered that their bird had developed a serious malfunction. How many others have ignored the warning signs during urgent missions and averted tragedy by the skin-of-their teeth? How many more who "had that feeling" didn't make it back?

Sounds, vibrations, handling characteristics — all of these have a special meaning to the helicopter pilot who has the experience, knowledge, and proficiency to detect their meaning. These factors seem to be part of the sixth sense and may be decisive during critical low-level missions.

First indications that this instinctive warning system is about to trigger may be a feeling of uneasiness in the pit of the stomach, a cool sensation down the spine, or a tug of conscience that says "don't do it." Most often the sensation passes quickly and, sometimes, is overlooked until too late. The sensation doesn't always indicate impending disaster. It may simply be an indicator that something unusual is happening or about to happen.

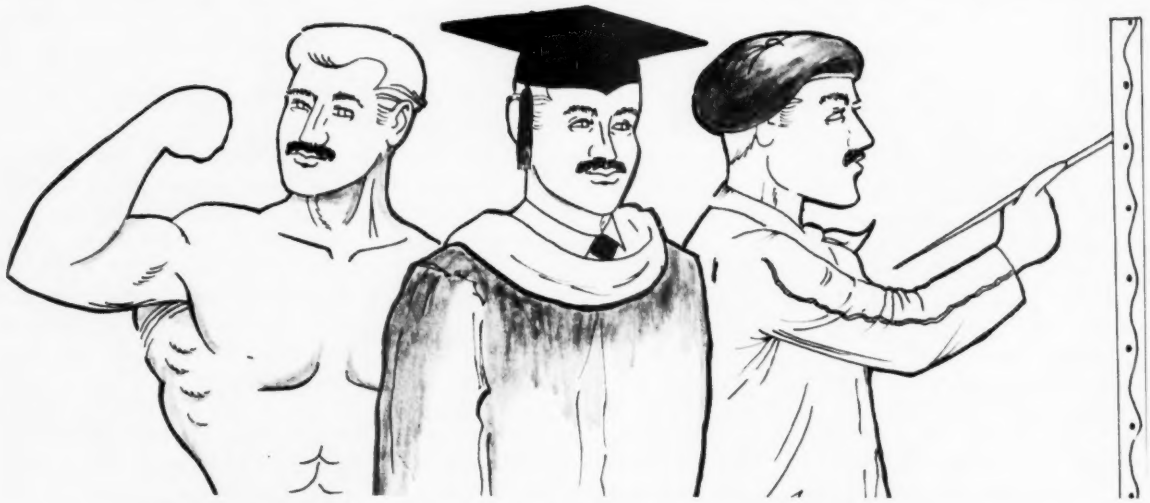
How long does it take to gain the "experience" necessary for this instinct? Many pilots never attain it. Some violate its effectiveness by disregarding the warning signals it emits.

Pilots who are fortunate enough to develop this feeling, whether it's called "sixth sense," "common sense," or "flying sense," are a step ahead of their machine to start with. Used effectively, this phenomenon can be a lifesaver. Disregarded in favor of barnstorming tactics or other personal whims, and it becomes as impotent as a flaunted safety rule.

Combined with self-discipline, proficiency, and a sense of personal responsibility, this "sixth sense" could be your guardian angel.

Life is milestoned by hills and valleys
but some days are real drop-offs.

BIORHYTHMS:



The Question of Ups and Downs

by Maj Carl A. Weaver, Jr.
U. S. Army Aviation School

Two thousand and four hundred years ago, Hippocrates made an interesting observation. He noted that people had their ups and downs. As a result of these observations, he advised his medical students to take these fluctuations into account in the treatment of patients. I am certain that you have also recognized your own good and bad days as well as those of your friends.

You are about to read an extraordinarily interesting explanation of the nature of ups and downs. As you read further, however, you must keep an open mind because the explanation is a hypothesis. It lacks sufficient evidence to allow its general acceptance as a theory. But there is a significant element of proof to support the contention that people do have ups and downs in a cyclical pattern, as you can read below.

Good and Bad Days

Every pilot has had those days when he can't do a thing right. He lacks endurance, energy and confidence. He seems to have little resistance to physical demands. On such days he fails to take that extra care preparing his flight or completing a checklist. These are the types of days when he might bounce one in — or forget to turn on that one important switch.

In contrast, there are those days when a pilot feels as though he can lick the world; everything clicks together. He is physically durable, cheerfully confident, intellectually creative, alert and full of logic and reasoning. It is on these types of days that he greases one in and doesn't miss a single task.

Since the days of Hippocrates, many others also have studied the problems. Then in the late 1800's man actually became aware of the importance of what Hippocrates was saying. On a grand scale, cycles of rhythms were related to galaxies and to the solar system. Researchers also frequently noticed the repeti-

tious, regular-interval level of activity in living things. Rhythms or cycles have been cited as characteristics of the living world. In fact, living world rhythms are the subject of a recently developed branch of biology known as biorhythmology. This branch is concerned with the entire spectrum of rhythms found in plants, animals and man.

Timing Mechanisms

Nearly everyone who has traveled rapidly across two or more time zones is familiar with the body's need to regulate itself and correct for the change in spatial orientation. This is due to the timing mechanisms that cause certain functions of the body to be cyclical in nature. That is, the functions rely on sequences of events which repeat themselves at regular intervals. The most commonly known cycle is the circadian rhythm which is about a day in duration. The circadian rhythm is associated with the 24 hour cycles of the body heart rate, temperature, blood pressure, sleep, and the like. Less commonly known, however, are the rhythms which are longer in duration. This article is about those longer rhythms.

One of the early pioneers in the study of biorhythms and their application to man was Dr. Hermann Swoboda, professor of psychology at the University of Vienna. During the 1890's his interest focused on several fields of study. One was the law of regularity; another the cycle of birth; and a third was a study dealing with the bisexuality of man. The results of these studies coupled with the results of his own research finding prompted him to wonder whether there might be some definite regularity to the fundamental changes in man's disposition as suggested by Hippocrates and others.

Dr. Swoboda's research efforts became intense following the turn of the century. Early efforts revealed that fevers, swelling, and pain were rhythmic in nature. Similarly, he conducted research in the field of human psychology and began to note periodic intervals generally based upon either 23 day or 28 day rhythms. In his search for the answer to these rhythms, Dr. Swoboda noticed that his patients had greater physical resistance for a period of time followed by a period characterized by slower progress and lower resistance.

Physiological Clocks

Unknown to Dr. Swoboda, a German contemporary was conducting similar research and making similar observations in Berlin. Dr. Wilhelm Fliess independently discovered the same 23 day and 28 day rhythms in man. Dr. Fliess was assisted by a mathematician and together they concluded that these rhythms could be traced throughout life. Dr. Fliess also observed that the 28 day rhythm corresponded approximately to the lunar cycle and to the female menstrual cycle.

A third rhythm was discovered around 1920 when Alfred Teltscher, a teacher and doctor of engineering, noticed that his students seemed to have intellectual ups and downs. Through his own research, which included statistical sampling, he concluded that intellectual performance fluctuated in a definite 33 day cycle. By 1930 researchers in the United States had become interested in biorhythms and accidentally discovered the 33 day rhythm.

Despite the efforts of Swoboda, Fliess, Teltscher and others, it was not until after World War II that general scientific interest in physiological clocks was intensified. This intensification can be attributed to rapid transit developments, the introduction of world-wide instant communications systems, and the advent of mechanization.

What Is a Biorhythm?

The biorhythmic theory postulates that there are at least three basic life rhythms that rise and fall at a regular pace in each human being. The biorhythmic theory further assumes that these rhythms contribute to our physical abilities, our emotional reactions, and intellectual capabilities. Biorhythms begin at birth. This coincides with the time at which independent life begins. It is the time that the heart beat, blood flow, breathing, nutrition and many other body functions become the responsibility of the new infant and its organs. All three known biorhythms start off together and for the remainder of the person's life a different relative combination of the three rhythms appears each day.

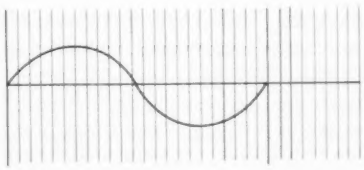


Figure 1
23 day physical rhythm cycle.

Masculine Rhythm

The 23-day cycle is known as the "physical" or masculine rhythm. It represents physical strength, physical endurance, energy, resistance, and confidence. Dr. Fliess believed this rhythm originated in the fibers of the

muscles. The first half of the cycle is the discharge period where a person feels vigorous. During this portion of the cycle a person normally performs physical tasks with ease. During the second half of the cycle a person is in the recharging period. During this portion of the cycle a person goes through a period of re-

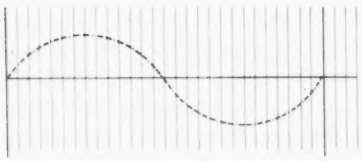


Figure 2
28 day sensitivity rhythm cycle.

cuperation and is susceptible to tiring easily and he is usually lacking in vitality and energy (see figure 1).

Sensitivity Rhythm

The 28-day cycle is known as the "sensitivity" rhythm. Due to its approximate correlation to the female menstrual cycle, it is known also as the feminine rhythm. This rhythm represents a cycle governing sensibility,

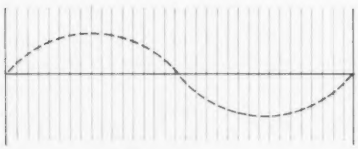


Figure 3
33 day intellectual rhythm cycle

nerves, feelings, intuition, cheerfulness, and moodiness. It is this rhythm that influences man's creative ability. The first half of the cycle is similar to the physical rhythm described above in that it represents the discharge period for emotions where the individual is in high spirits. During the second half of the cycle a person is more likely to be in a bad mood and easily irritated (see figure 2).

Intellectual Cycle

The third biorhythm is a 33 day intellectual cycle. During the first 16½ days of this cycle a person's memory is usually keen, he is very alert, displays logic, reacts with reason, and is rather ambitious in his thinking. During the second half of the cycle, one may find himself forgetting little things, lacking in the ability to intensely concentrate, and his mind wandering (see figure 3).

At first glance it would appear that the critical periods are those that show the curves below the median. This is not altogether true. It is the point at which the curve crosses the median from plus to minus or vice versa that is critical. It is at this time that the system represented by the curve is in a state of limbo. The system is neither active (discharging) nor resting (recuperat-

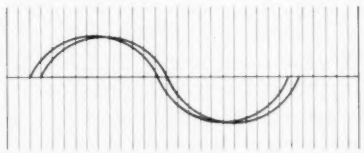


Figure 4
The first line represents a cycle beginning with a birth during the early hours of the day. The second line shows the rhythm cycle for a birth during the late hours of the same day.

ing). The point at which a rhythm curve changes status and crosses the median is known as the critical day. These are the switch point days and must not be considered critical in themselves. They are, however, days when a person's reaction to his surroundings (because of his biorhythms) may bring about a critical situation. On the other hand, the position of the curve or curves below the line offers an explanation to the "bad" day feelings that we have all experienced at one time or another.

A critical day represents a period of about 24 hours. The starting point of the curve, therefore, becomes important to the exact plot of a critical day. If the person is born close to midnight his biorhythm plot would be slightly different from one that represents his birth if it were just after midnight. Knowing the exact hour of birth allows for more accurate plotting of one's biorhythms (see figure 4).

Application of Biorhythms

Biorhythms may be plotted in any number of ways. For the pur-

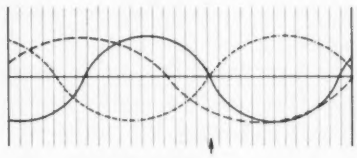


Figure 5
Superimposed curves with a double critical day.

pose of simplicity, the sine curve is used by George Thommen, a well known researcher in biorhythmic theory, and other experts in the field. During the pioneer days of the study of periodicity, Dr. Swoboda designed a calculator so that the critical days could easily be found. He designed the handheld, rapid calculator in hopes of encouraging physicians and others to use and experiment with the biorhythmic theory. There are still several calculators on the European market

today, but none of them provide the advantage of the sine curve. The sine curve, unlike the calculator, provides a visual presentation of the entire oscillation of the curve or curves in question.

When all three curves are plotted on the same axis with respect to the subject's birthdate, the position of one curve can be determined in relation to the other two. Their relative positions reveal several things. As stated, a critical day is indicated by the point at which a curve crosses the median line or axis. Superimposing the three curves readily shows double or even triple critical days (see figure 5). When all three curves are below the line or median, the subject is susceptible to becoming easily tired, moody, and not very alert.

The obvious attraction to this type of presentation is that it provides the untrained reader an "explanation" for past events. Similarly, the charts may be bad for the untrained reader who becomes carried away due to the chance of autosuggestion. This situation might in some way cause a person to feel low if you

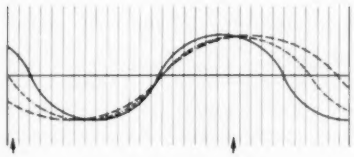


Figure 6
July 1969 biorhythm chart for Astronaut Edwin E. Aldrin, Jr.

show or tell him that he is supposed to feel low.

According to the biorhythmic theory, each of us is supposed to have — at the most — 11 critical days per month. Of course double and triple critical days arrive with less frequency. The three biorhythms come back to the starting point on the median in the position they were in at birth after 58 years and 66 days. Aside from the obvious attractions and distractions of the rhythm charts, there are three definite applications for the biorhythmic theory — planning or decision making, medicine, and safety.

Planning with regard to biorhythms has the potential of being extremely effective. Consider the person responsible for the planning or scheduling for someone whose activities require an unusual degree of physical strength or coordination; i.e., a boxer or a competition weight lifter. Similarly, a planner can take biorhythm charts into account when unusual degrees of concentration are required as is necessary for decision making. To illustrate the planning application, examine the biorhythm chart for the astronaut who landed the first spacecraft on the moon on 20 July 1969 (see figure 6).

There is no need to explain the obvious physical and intellectual concentration required to accomplish the moon landing. As everyone knows, the moon landing was highly successful. Note in figure 6 that the date Astronaut Edwin E. Aldrin, Jr., set foot on the moon coincided with a "peak" period on his chart.

A second application of biorhythmic theory is in the field of medicine. Medical application is fairly well documented because until recently most biorhythm research has been accomplished for medical purposes or in a medical environment. Medical applications are rather obvious; operations could be scheduled according to the biorhythms of the patient and the operating surgeon. Consideration should also be given to the position of the rhythms with respect to the postoperative period of recovery. Dr. F. Wehrli of Switzerland has used biorhythms in his hospital for more than 15 years. He reports that there has not been a failure or complication in more than 10,000 operations.

A third area to which the biorhythmic theory is applicable is that of safety. Studies by safety consultants and insurance companies have shown that 70 to 80 percent of all accidents occur on critical days. According to Thommen, a recent study by R. K. Anderson Associates shows that 70 percent of the 300 accidents charted in four industrial plants occurred on critical days.

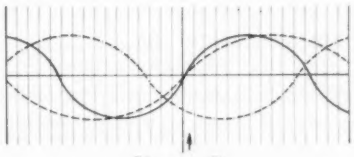


Figure 7
Accident related double critical day for the months of May and June; subject born 2 March 1940.

Biorhythms vs Accidents

Accidents are most likely to occur when the physical and sensitivity cycles are at critical points. That is not to say that accidents won't occur on other days, only that they are more likely to happen when a person is not up to par emotionally or physically. The following experience reinforces the accident theory as it pertains to biorhythms. A friend of mine went on vacation recently. His enthusiasm was high because he had just purchased a new automobile that was sure to make the trip more enjoyable. Upon his return, I routinely asked him how his trip had gone. He related to me how things were hectic as he prepared to depart. He then proceeded with a five-

minute dissertation about how annoying drivers are these days. He told me how he had been confronted by one annoying driver who caused him to wreck his new automobile. His story went on to describe that while his car was being repaired, he was in high spirits and had accomplished a great deal of personal business to include the sale of his house and the entrance into a lucrative business partnership. Because of my newly acquired knowledge of the biorhythmic theory, I plotted his chart for the end of May and the beginning of June. The results were interesting to say the least (see figure 7). The subject, born on 2 March 1940, wrecked his automobile on 1 June 1973, a double critical day.

Now that biorhythms have been tied to accidents, you probably wonder if there is an application to aviation safety. It has been reported that one European airline has maintained an excellent safety record for more than 20 years with the aid of biorhythms.

Plotting biorhythms permits you to check past events. I used this technique to examine Army aviation accidents for the past two and one half years. With a relatively large sample of one-fourth of the pilot error accidents not related to materiel failure, I plotted the biorhythms of the pilots. Nearly half, or 49 percent, of the accidents clearly occurred on a critical day. More than 64 percent of the "critical" day accidents happened on double critical days. There were numerous accidents not included in the 49 percent which occurred when all three cycles were low or when the incident was bracketed by critical days before and after.

Just as you can examine the past, you can also prepare for the future. The plotter of biorhythms can chart his future and remember to exercise special care on critical days. Since many other factors influence accidents, no ironclad predictions can be made. You can take advantage of the biorhythm system by warning yourself in advance to "be extra careful today."

Method of Computation

No discussion of biorhythms is complete without an introduction to at least one method of computation. Basically, to compute the locaton of a curve on a particular day, it is necessary to add up all the days a person has been alive to that point in time. The next step is to divide this total by 23 for the masculine rhythm; by 28 for the feminine rhythm; and by 33 for the intellectual rhythm. You must remember to add a day for each year that is a leap year except for the years 1800 and 1900 which are special cases in the four-year cycle. The following example computes the biorhythms for the 1st of June 1973 for a person born on 27 June 1960:

Example:

Days in 1960, 27 Jun thru 31 Dec	188
Days from 1 Jan 61 thru 31 Dec 72 (365 × 12 plus 3 leap year days)	4,383
Days from 1 Jan 73 thru 1 Jun 73	152
	4,723

Dividing 4,723 by 23, 28 and 33, we arrive at the following:

23 day — 173 complete cycles and a remainder of 8

28 day — 142 complete cycles and a remainder of 19

33 day — 120 complete cycles and a remainder of 4

This means that for the 1st of June 1973 the rhythms are on their 8th, 19th and 4th days of each cycle respectively.

Of course, there's always an easier way to do most things. George Thommen in his book "Is This Your Day?" provides quick reference tables and the instructions for the construction of a simple plotter and scales.

It would serve no real purpose to fill this article with examples in order to prove a point or to support conclusions. The few examples I have shown are in no way conclusive. They are merely representative of biorhythm plots for various situations involving several areas of application. To statistically support the theory, a very large sample relating to various situations would have to be taken. This might well be a job for a computer and a team of experts in biorhythmology.

Now that I have "wet your whistle," I think that you will agree that the biorhythmic theory is interesting. It must be reemphasized, however, that it is a hypothesis and has not been proven conclusively. We all realize there is much more to our physiological makeup than we fully understand. When we acquire this full understanding it may be found that biorhythms are the answer to the questions raised by Hippocrates and others concerning man's ups and downs. Perhaps then there will be a better understanding of man/machine relationships which will enable us to improve our status in this complex era of mechanization.

— U.S. ARMY AVIATION DIGEST

Global Notes

award winners

Congratulations to all units and personnel chosen to receive MAC safety awards for 1973. Flight safety winners were:

The MAC Trophy

Twenty-second Air Force

MAC Safety Officers of the Year

Left: Capt Jack N. Dole (Primary Duty), 63d Mil Alft Wg

Right: Capt Gary E. Lorenz (Additional Duty)
54th ARRS, Pease AFB

MAC Safety NCOs of the Year

Left: SSgt William E. Roberts (Primary Duty),
2 WW, Ramstein AB

Right: MSgt Winslow W. Crockwell (Additional Duty),
603 MASS, Kadena

MAC Distinguished Wing Flight Safety Award

39th Aerosp Resc & Recovy Wg, Eglin AFB

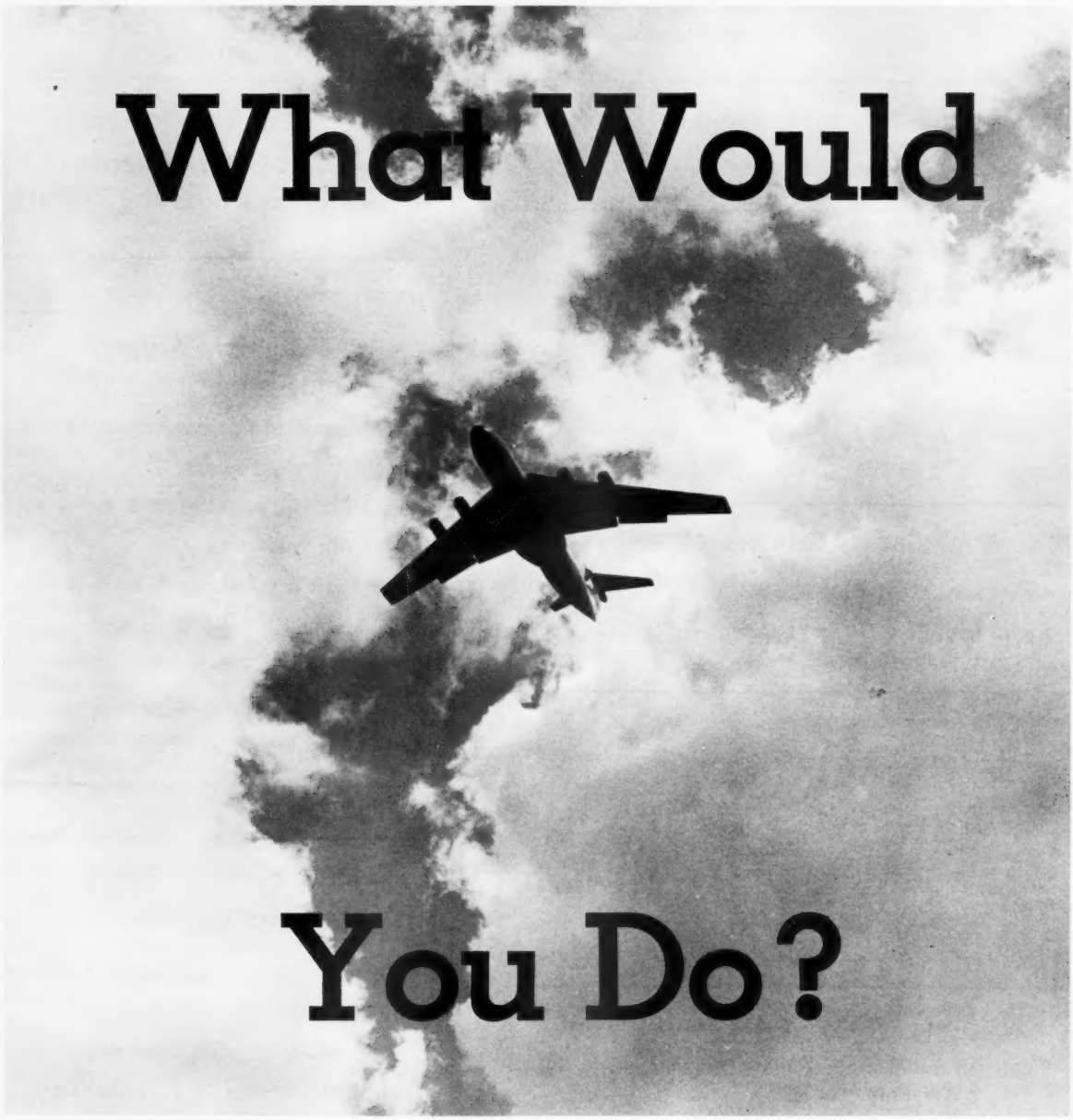
MAC Flight Safety Achievement Award

39th Aerosp Resc & Recovy Wg, Eglin AFB
60th Mil Alft Wg, Travis AFB
62d Mil Alft Wg, McChord AFB
63d Mil Alft Wg, Norton AFB
89th Mil Alft Wg, Andrews AFB
375th Aeromed Alft Wg, Scott AFB
436th Mil Alft Wg, Dover AFB
437th Mil Alft Wg, Charleston AFB
443d Mil Alft Wg, Altus AFB

MAC Support Safety Achievement Award

602d Mil Alft Spt Sq, Elmendorf AFB
603d Mil Alft Spt Sq, Kadena AB
604th Mil Alft Spt Sq, Clark AB
618th Mil Alft Spt Sq, U-Tapao Afld
TUSLOG Det 175, Incirlik, Turkey

Making an approach through an area of severe weather isn't a pilot's favorite pastime, but many pilots gamble against their better judgement.



The command post notified an inbound C-141 of numerous thunderstorms near the base and heavy rain showers on the approach end of Runway 02, the active runway.

The aircraft commander requested clearance to hold at FL 240. He wanted to analyze the weather picture further before making an approach.

While he was holding, a flight departing Runway 02 reported VMC up to 4,000 feet. The command post suggested that the C-141 execute an ILS approach to Runway 20, since the weather was clear in that quadrant.

The aircraft commander agreed, and requested the ILS to Runway 20. Approach control vectored him north for sequencing. But landing traffic on Runway 02 made sequencing difficult, and after 20 minutes of vectoring, approach control advised that the weather picture on the approach to Runway 02 had improved. The controller offered an immediate PAR approach to that runway. Tired of vectoring around the countryside burning up fuel, the aircraft commander accepted the offer.

Approach control gave the flight a southerly heading, but as the aircraft turned to base leg, the controller warned of heavy rainshowers from two to seven miles on final.

That did it. The aircraft commander refused to continue the approach. Instead, he got clearance for a VMC, radar monitored approach to Runway 20. The flight remained VMC and the plane landed with no difficulty.

What would you have done under similar circumstances? Other aircraft had executed approaches to Runway 02, which was the active runway. Would you have expended holding fuel, as this aircraft commander did? Would you have landed on Runway 20 when the normal flow of traffic was to Runway 02? Or would you have gone ahead, as other aircraft did, and accepted what was offered?

It was reported later that one of the aircraft which executed the Runway 02 approach ran into rain showers and visibility of one-half mile. The plane landed 5,000 feet down the runway with a quartering 12 knot tailwind.

In making his decision not to land on Runway 02, the aircraft commander in this incident reasoned that the approach to Runway 20 would be safer for several reasons: the weather would be clear on final; the aircraft would be landing into a headwind instead of a tailwind; runway 20 was the primary instrument runway which, in addition to radar vectoring, offered VOR, VORTAC and ILS approaches, while Runway 02 offered only radar and VORTAC approaches; one aircraft had departed to the north and reported VMC. Another had landed from that direction and reported no problems.

The aircraft commander questioned the logic, although not the "legality," of establishing Runway 02 as the active when weather conditions made Runway 20 obviously more desirable. He felt that pilots were being influenced to use the approach from the south because Runway 02 had been designated the active.

He felt so strongly that he submitted a hazard report.

Runway use selection is not based solely on wind direction and velocity at a given moment, and runways are not necessarily changed due to temporary thunderstorm activity. There are many factors considered before runway changes are made, and cases such as this one call for sound judgment by the aircraft commander when things don't look right to him.

This incident shows some of the processes involved in decision-making. The aircraft commander reasoned objectively, refusing to accept what he considered was an unsafe clearance even though other pilots before him had complied with identical instructions.

At the risk of appearing "different," he made up his own mind.

What would you have done?

A no-sweat attitude, granddaddy CB's, pressure door problems, and get-home-itis pin C. R. between a rock and a hard spot.

The Ace of Aerospace dribbled across the Dover ramp and bounced into the cocked Starlifter, its wings arched aggressively downward with its load of JP-4.

C. R.'s crew busily accomplished predeparture cockpit duties. Eyes fixed to the radar scope, Blinky fingered a plethora of radar switches and knobs. Sergeant Torque balanced fuel between the auxiliary and extended range tanks. Long Suffering Sam sat in the right seat adjusting the jungle of wiring and oxygen plumbing about his head. Several deep inhalations of the refreshing oxygen and a quick check of the mask interphone completed Sam's oxygen system check.

Grasping the handrail, C. R. strained his corpulent torso into the cockpit arena and blurted, "Before starting engines checklist! Let's get this bent wing bug sucker headin' west to Frisco, spiritus fermenti and Tassles."

"Sir," pleaded Blinky, "I was about to call the command post and get maintenance to look at the radar. Look sir, no returns beyond the 30 mile range. Now I'll switch back to 30; see, real weird patterns. The radar is screwed up and we're gonna need it enroute to Travis. Remember, the forecaster predicted bad news CB's between Denver and Salt Lake City with some tops above 50 grand."

"M'boy, I've encountered such situations many times and there's no need for concern. Why, with only one pallet we'll be able to fly wing position on an SR-71 and we've got enough go-fast gas to make SUU-ville via Panama."

"Major Terror, scanner just called. We ain't gonna fly no frappin' wing on an SR-71 if we don't get our pressure door locks fixed—Sir," scolded Sgt Torque.

"Sarge, there's hardly a 141 flying these days without pressure door problems," replied the Tamer of T-tails. "If ya have any trouble with the pressure door, limit the pressure differential to four or five p. s. and i. Besides, radar and pressure door maintenance might mean another day here, more shuttles and such. We've got a straight shot flight to the west coast, so let's fire-up the fans, slip the surly bonds, and get on that interstate highway in the sky," insisted the Dauntless Driver.

Sufferin' Sam mashed the microphone button and radioed, "Dover clearance delivery, MAC 60487, IFR Travis; request ATC clearance."

"MAC 60487 is cleared to the Travis airport via Jet 80, Stockton, direct. Maintain flight level 350."

* * *

"Gear up m'boy," directed the Aviator with Avoirdupois. "Next stop is Californy land."

The Starlifter threaded its way on a westerly course through the

dense network of east coast airways. Verdant, pastoral settings of Pennsylvania and Ohio appeared as the smoggy metropolitan landscapes faded behind. North of Wright Patterson, echoing hunger pangs within C. R.'s rotund frame yearned to be squelched.

"Sammy m'lad, 'tis time for your Commander to dine on tenderloin brochette and retire for a no-notice nap. The rigors of command and responsibility demand sustenance and rest," philosophized C. R. "Keep this aerodynamic marvel at 350 and wake me about 100 out of Stockton."

"MAC 60487, contact Kansas City Center on 134.7 VHF or 362.3 UHF."

"Wilco, MAC 487," acknowledged the copilot. Quickly switching frequencies, Sam reestablished contact with Center.

"MAC 60487, radar contact; eastbound traffic at twelve o'clock is a United 747 at flight level 370," advised Center.

"MAC 487 has traffic in sight," answered Sam.

"Copilot, nav."

"Go ahead, Blinky."

"Why don't you give that United 747 a call and find out what the weather is like between Denver and Salt Lake," invited Blinky.

"Darn good idea Blinky. United 618, this is MAC 60487, over."

"Go ahead MAC."

"United 618, what's the weather like between Denver and Salt Lake?"

"Pretty bad MAC, CB's all along Jet 80 with tops at 350 and building rapidly. Probably be wise to deviate 20 to 30 miles north of Jet 80. CB's south of course top out well above 40,000 feet."

"Copied all, United. Thanks, MAC 487."

"Navigator copied all."

"Hey Blinky, do you think you could get the radar going?" queried Sam.

"No way, Sam. I've been working at this scope since level off with no luck at all. Sam, take a look at that horizon!"

"Blinky, there's a certain four letter word that doesn't quite do justice at times like this. Pull the curtain back and wake up the boss," directed Sufferin' Sam. "I think we're in for an interesting flight."

"Major Terror, wake up! Sir, we've got problems," revealed the concerned navigator.

"Yaawwarrh, time sure flies on these CONUS runs. How far out of Stockton are we naviguesser?" quizzed the Sleepy Skipper.

"Sir, approximately 920 miles. We got you up because, well sir, the reason is there's severe weather ahead," defended Blinky.

C. R. squinted through the cockpit window toward the distant horizon.

"Goulash, a few wispy cloud puffs and you guys panic. Back in the old days when men were men and machines lacked such crutches as power, speed, radar, and troublesome black boxes, we spent 15 to 20 hours at a clip threading our way through weather, the likes of which you novices have never experienced. Why, I remember a Pacific trip in Ole Shakey back in '58. Snaked our way at 8,000 feet, 175 knots, through hours worth of granddaddy cumulo nimbo, icing and..."

Clear air turbulence, a barometer of things to come, suddenly jolted and pitched the T-tailed transport earthward. The brief force pitched the Rotund One into the upper circuit breaker panel from which he ricocheted onto the cockpit floor behind the surprised navigator.

"Yeeeooow, fasten seat belts, max power, secure all stations," bantered the pompous, but prone, pilot.

Grasping at anything bolted to the cockpit, C. R. slowly staggered up and finally slumped into the left seat. Tightly cinching his shoulder straps and seat belt, he sat stunned, staring, at a boiling ballet of thunderbumpers frothing skyward, just off the Starlifter's nose.

"Quick, Sam, get clearance to deviate! Get climb clearance to 390; no, make that 410. I'm aiming this super silo toward that saddle at two o'clock."

Sam put his oxygen mask on and obtained climb clearance.

"Pilot, you're over boostin' the engines! Max EPR is 1.95," emphasized the busy engineer.

"No sweat, these Pratt and Whitney stove pipes routinely feast on stove bolts. Hell, they're just gettin their second wind, engineer," soothed C. R.

With fans laboring beyond the maximum EPR, the C-141 clawed its way to flight level 410, closer to the seething mass of nature's wrath.

"M'boy, we're in fat city. We'll top the saddle between those cells by a comfortable margin.

"I sure hope you're right, boss," interjected Sufferin Sam anxiously. "I've been watching that saddle slowly dissolve and adjacent cells merge into one big battering ram. Sir, I don't think we're going to make it over that

C.R. Terror —continued

saddleback at 410. Why don't we do a 180 and go to Altus or McConnell and hold up until this stuff blows over?" pleaded Sam.

"Retreat because of a little weather? Humbug! In 25 or 30 miles, we'll be on the other side, home free to Frisco."

The C-141 struggled to remain in the clear, but the merging buildups completely engulfed it. The cumulo nimbus clutched the dwarfed Starlifter and throttled it skyward.

"Aaaarrrggghhh, Battle st-stations, everybody, strap in! We're climbing to flight level 450," cried the Shakey Steersman.

"But sir, we just passed 460," shouted Blinky. "I can't see my instruments; they're all a blur. Sir, we're icing up, bad. I can't even see out my window!"

Violently tossed about, the cockpit became a spectacle of ricocheting maps, pencils, box lunches and briefcases. C. R., Blinky, and Sgt Torque, fastened securely to their seats, dodged the projectiles as best they could. They were speechless.

As suddenly as the updraft had shot it skyward, a vicious downdraft clenched the nearly stalled, icy jet, and cascaded it deep into the bowels of the maelstrom.

Vertical velocity increased rapidly — six, eight, ten, 18,000 feet per minute. Inside the cockpit, hanging in their shoulder straps, C. R. and Sam stretched their hands toward the throttles. Finally reaching them, Sam retarded the throttles to a low cruise setting. In spite of reduced power, the downdraft accelerated the 141 earthward, howling like a wounded banshee. Then a deafening roar penetrated the cockpit.

"Hail, we're in hail," yelled Sam.

C. R. sat motionless, straining to quell his anxiety. The aircraft would not respond to control inputs and was, at that moment, at the mercy of this cumulus monster.

With one final burst, the diabolic nimbus spat out the reckless intruder.

"Whew! Sammy m'boy, on a scale of one to ten, that brief excursion would rate about a seven, but I've seen worse," revealed the Ace Aviator.

"More like 25 on my scale. Next time you decide to play cat and mouse with a thunderstorm, you can leave me behind," blustered Sergeant Torque.

"Sir," interrupted Blinky, "the wing leading edges and engine nacelles are all dented up."

"Whaaa," bellowed C. R. quickly manipulating his thoughts. He rationalized, "Could have been far worse if it wasn't for my superb aeronautical adroitness. That squall line just popped out of nowhere 'n before we knew it we were in it. Next time, Sammy, take a closer look at the weather briefing. If you had got me up a little sooner, I could have steered around the weather. Consider this a valuable lesson learned Sammy m'boy."

Before C. R. could start on his navigator, the strain of the turbulent penetration took its toll on the pressure door locks that Sergeant Torque had detected on preflight. Door locks, now stretching in their mounts, began yielding one by one; then suddenly, the pressure door gave away.

C. R. was inserting a gold ringed Egyptian Oval in his ivory cigarette holder as the quiet cockpit routine exploded into a crescendo of fog, bright lights, warning horns, and flying debris. C. R. struggled in vain to locate his oxygen gear. Instinctively, the rest of the crew donned their masks and in a few seconds were inhaling the life saving gas.

"Mayday, mayday, mayday; MAC 60487 departing flight level 350 for 200, explosive decompression and possible structural damage," announced Sam to Salt Lake City Center. Sam, already breathing oxygen, smoothly rolled into a steep bank, retarded throttles, deployed spoilers, and descended rapidly. Looking across the cockpit, Sam cringed as Major Terror slumped awkwardly on his left side.

"Blinky! Get some oxygen to Major Terror; he's passed out," commanded Sam. "Salt Lake Center, MAC 60487 requests immediate vectors for an emergency landing at Hill. Six souls on board, all forward, eight-eight thousand pounds of fuel. Request flight surgeon and ambulance, over!"

"Copilot from nav, Major Terror isn't responding!"

"Nav, you and the loadmaster get him out of the seat, then get in the left seat, nav, and help me with the radio calls. Load, you give oxygen to Major Terror!" ordered Sam.

"Yes sir," replied the loadmaster.

"Engineer, get Sergeant Cord. Get him a restraining harness and walk-around bottle. Have him perform cabin inspection and report any damage," directed the copilot.

"Yessir, he's already on it," replied Sergeant Torque.

"Copilot — nav, I checked the area terrain and 20,000 will clear everything."

"Thanks Blinky."

* * *

"MAC 60487 you're passing outer marker. Cleared ILS to runway 14; report wheels down. Emergency and fire-fighting equipment standing by," announced Hill Approach Control.

"Wheels down, MAC 487," replied Long Sufferin Sam.

The battered aircraft touched down smoothly amidst a dizzying display of whirling red lights on the ramps and taxiways.

As Sam shut down the aircraft on the runway, C. R. regained consciousness.

"Aaaaooohhh, what happened? Wh-wh-where are we?" mumbled the Fearless Flyer.

"Take it easy sir, we've landed at Hill. We had an explosive decompression and Captain Sam brought us in okay. Bird's damaged pretty bad, sir, but everyone's okay except you," comforted the loadmaster.

Later, at the base hospital, C. R. regained his bon-vivant and busied himself with one of the nurses, Captain Charlene Charming.

"M'dear, fate works in strange ways. Just think, I wouldn't be here healing under your charismatic care if my oxygen gear hadn't failed. My second in command assumed the helm and brought us in on a wing and a prayer. Taught him everything he knows. When I'm well in a week or two, why don't we get together and . . ."

Major General Fang, a top USAF commander, who happened to be on a staff visit to Hill, walked briskly into the ward, interrupting the silver tongued tenor.

"Captain Charming, I'd like to have a word with Major Terror in private," ordered the general. As the captain departed, the general turned to the patient.

"Major Terror, I just received a preliminary briefing of your accident. Fact — your oxygen mask was discovered under your flight jacket — disconnected. Fact — flight was conducted into a severe weather area. Fact — a valuable MAC aircraft was damaged by hail in this severe weather area. Fact—flight was conducted into weather without an operational radar.

"There are more facts and we will discuss them in detail when you return to home station. Good day Major!"

The Gripper of Throttles, stunned at this sudden setback, signaled for Captain Charming.

Entering C. R.'s private room, the beautiful blond nurse commented, "I've never seen a general in here before. Must have been pretty important sir."

"Nothing unusual, m'dear. I often associate with high ranking officers. General Fang and I discussed some confidential operational matters concerning the difficult air emergency which I capably quarterbacked to a safe recovery today. In fact, the General and I are going to confer again at home station as soon as I recover.

While on the subject of recovery, my neck and shoulder muscles are acting up again. Charlene m'dear, would you mind massaging my neck and shoulders. I've been through so much."

"Why of course, Major Terror."

Snap, Crackle, and Pop

No, we're not advertising breakfast cereal, but a T-39 crew heard such sounds in their machine shortly after takeoff, and the source turned out to be a dozen vertical and horizontal cracks spreading up and across the pilot's windshield.

From his vantage point in the right seat, the copilot observed electrical arcing at the origin of the cracks in the lower left corner. He switched off the windshield heat and the pilot returned to the airport and landed without further difficulties.

Investigators traced the cause of the cracks to an overheat condition caused by a faulty temperature control unit.

Another case of an unusual emergency handled properly.

Precise Approach

The airliner was flying an ILS final approach in VFR conditions. All cockpit instruments looked normal and the aircraft appeared to be on glide path.

But an alert tower operator noticed that the aircraft seemed lower than normal so he requested its altitude. The pilot gave the altitude call and began checking his letdown plates, cockpit cues, and outside references. He found that he was indeed, low, although his crossbars indicated on glide path. Why such a discrepancy?

Prior to this approach, FAA maintenance men had begun testing the glide slope transmitter. The test was peculiar in that it caused the device to transmit an "on glide slope" indication, regardless of the aircraft's altitude.

Since the pilot was flying in visual conditions, a potential disaster was averted.

The pilot should have received the test information through the ATIS broadcast, but it wasn't on tape. Tower personnel should have advised the pilot of the ILS test, but they didn't. And, the pilot could have observed outside references and compared them with the altitudes listed on the letdown plates, but he didn't.

Remember, it is still the crew's responsibility to keep clear of obstacles while flying in visual conditions. Don't count on the other guy keeping you out of trouble.

Compressor Seizure

As the KC-135 accelerated through 145 knots on takeoff roll, number four throttle suddenly slammed back to the idle stop, causing the aircraft to yaw abruptly to the right. Already committed for takeoff, the pilot corrected back to the runway centerline as the copilot advanced the "good" throttles to the full increase.

The pilot rotated the aircraft at 165 knots, eight knots above that computed, with 3,000 feet of runway remaining.

Once the plane became airborne, the pilots began troubleshooting number four engine. As the copilot advanced number four throttle, the fire warning light illuminated. The pilot pulled the throttle back to the cutoff position and pulled the fire switch. A scanner reported flames streaming over and under the wing near number four. Flying radar vectors away from populated areas, the pilot ordered fuel jettisoned to lighten the burning tanker.

Nearing final, one of the crew men reported that the fire was out but that number four engine looked as if it might separate from the aircraft. Fuel jettisoning was completed on final and the pilot flew the PAR approach to a smooth touchdown and braked to a stop on the runway.

Takeoff emergencies such as this one require intense concentration on aircraft control and prompt emergency analysis. A pilot must be spring loaded for the unexpected if he is to effectively handle such abnormalities. Would you be ready to instantly apply an alternate plan of action if your aircraft started coming unglued on takeoff?

Cool Off, Light Off

A crew member in another command received second and third degree burns on the lower portion of his body during aircraft prelaunch operations.

While awaiting the launch, the individual was uncomfortably warm and decided to cool off by placing an oxygen hose inside his Nomex flight suit. He set the regulator to 100 percent and "emergency" to provide a flow of cool air. He lit a match, presumably to light a cigarette, and a flash fire enveloped the unsuspecting soul. Extensive burns required aeromedical evacuation of this painfully burned crew member.

This almost unbelievable act resulted in predictable results. However, during investigation into the incident, witnesses indicated that the use of oxygen for body cooling was common at this base.

In a 100 percent oxygen environment, almost anything will burn if a source of ignition is present. Remember, the fire protective qualities of a Nomex flight suit work best when the fire is on the outside.

Qs —continued

Devious Dysbarism

After 40 minutes of a high altitude, low opening (HALO) mission, the loadmaster developed severe pains in his right shoulder, elbow, and ankles. He didn't complain about the pain until the aircraft had landed, an hour later.

The flight surgeon determined that the dysbarism was caused by insufficient oxygen intake prior to the high altitude, unpressurized flight, and that this condition was aggravated by the length of the flight.

All crew members, except the loadmaster, had prebreathed 100 percent oxygen for 30 minutes prior to takeoff. Preflight duties prevented the loadmaster from participating in the oxygen prebreathing. Although he did breathe oxygen during climbout, further flight duties kept him too busy to stay on oxygen continuously.

Tech orders did not require prebreathing oxygen, but this loadmaster might have minimized his plight by "sounding off" as soon as he experienced pain. He could have caused serious problems for the crew had he been rendered immobile by dysbarism. Let the crew know when you can't function properly because you could be asked to perform a critical duty. And besides, remaining quiet could kill you.

Stay Off the Paint

Lacking anti-skid and thrust reversers, a T-39 can be a tough little bird to stop, particularly on a wet runway. The brakes are touchy and blown main gear tires are often the result of poor braking techniques. In spite of these well known wet runway braking characteristics, a few T-39 drivers occasionally exceed the design limits of main gear tires. Here's another recent case.

After a normal approach and landing, light braking was applied at 75 knots on a wet runway. Both pilots felt a distinct thump as the left tire blew. The aircraft veered toward the left side of the runway onto the paved shoulder. The bird continued for another 1,000 feet before stopping at a 20 degree angle from the original landing heading.

RCR on the centerline at the time was near that of an icy runway. Therefore, very little brake pressure was required to lock the left main wheel after it touched down on the centerline. As the locked wheel departed the slick centerline for coarser real estate, it failed to roll and blew out.

The T-39 is, perhaps, more susceptible to locked wheels, skidding, and blown tires than many of the other MAC birds. But poor braking technique in any aircraft could turn that confident "grease job" into an unexpected slide into the boonies.

after deadline . . .

EASY WITH THE WHIFFLE TREE -- The whiffle tree is a valuable device when used properly. But WRAMA has a word of caution for loading crews. Don't torque the whiffle tree. It does have limitations. If the attachment ring on the trailer or cargo is located relatively low to the ground, chances are the tree won't be damaged. On the other hand, consider winching aboard your aircraft an empty MHU-7/M or MHU-123/M trailer to within a few feet of the whiffle tree while using the off-centerline loading technique. Note the rise in the cable from the whiffle tree pulley to the attachment point on the trailer. The resulting twist to the pulley shackle puts unnecessary strain on the cable itself as it chafes against the sides of the pulley groove. This effect can be minimized by moving the whiffle tree as far forward as possible. Remember, there is no pulley swivel provision so don't winch the trailer in too close to the whiffle tree.

A "caution" has been added to TO 1C-141A-16-1 on page 1-18 and 1-19. It states, "Do not install whiffle tree aft of fuselage station 938 when routing winch cable to an off-centerline location." The purpose of this caution is to minimize twisting or torquing of the whiffle tree resulting from winching the load up next to the tree.

NEXT MONTH -- Feature articles next month include:

* An Emergency? Cool it! -- A discussion about the pilot's responsibilities during an inflight emergency.

* Squawk Mode Charlie -- A look at the new requirements for an altitude reporting transponder. How will this affect MAC's operations?

* What's Up Doc? -- Over age 35? You can expect additional tests during your next flight physical to detect problems in the making.

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The Heritage

The clock runs slow and time seems lost for
what may never come,
And like the vulture sitting there, I wait
to start my run.

My comrades are the best of breeds, like men
of other days,
For Spads and Camels fit their souls, as
freedom fits their ways.

To act and fly, discovering what other men
may dream,
The depths of fear, a challenge clear,
where life is what it seems.

The gauntlet's run, we have him now, and
yet there's still much more,
The challenge repeat, to be complete, the
return through hell's great roar.

O Lord I've waited O so long, and practiced
for this time,
Please let me do my best today, now that
he's on the line.